THREE NEW SPECIES OF *CALOSTAURUS* (CESTODA: DAVAINEIDAE) FROM THE NEW GUINEA WALLABY *DORCOPSIS VETERUM*

by IAN BEVERIDGE

Summary

BEVERIDGE, I. (1981) Three new species of *Calostaurus* (Cestoda: Davaineidae) from the New Guinea wallaby *Dorcopsis veterum*. *Trans. R. Soc. S. Aust.* **105**(3), 139-147, 11 December, 1981.

Three new species of *Calostaurus* Sandars (Cestoda: Davaineidae) are described from the small intestine of the macropodid marsupial *Dorcopsis veterum* from New Guinea. *C. dorcopsis* sp. nov. differs from *C. macropus* in the size and arrangement of rostellar spines, size of rostellar hooks and cirrus sac. *C. oweni* sp. nov. and *C. parvus* sp. nov. resemble *C. mundayi* in features of the rostellum, but differ in size, number of testes per proglottis and number of eggs per egg capsule.

Introduction

Three species of the davaineid cestode genus *Calostaurus* Sandars, 1957 are known to occur in Australasian macropodid marsupials, namely *C. macropus* (Ortlepp, 1922) originally described from *Thylogale brunii* (Shreber, 1778) (Syn. *Macropus brunii*) and redescribed by Sandars (1957) from *Thylogale stigmatica* Gould, 1860 (syn. *T. wilcoxi*) in Queensland, and *C. thylogale* Beveridge, 1975 and *C. mundayi* from *Thylogale billardierii* (Desmarest, 1822) and *Potorous tridactylus* (Kerr, 1972) (syn. *P. apicalis*) respectively, both occurring in Tasmania (Beveridge, 1975). In each instance, a single host species is parasitised by one cestode species only. By contrast, in collections of cestodes made recently from the wallaby *Dorcopsis veterum* (Lesson, 1827) in New Guinea by Dr I. L. Owen, three cestode species may occur in the same host individual. The three species are described in this paper.

Methods

Cestodes were stained with Celestine blue, dehydrated and mounted in balsam. Serial sections of each species were cut but the state of preservation of the specimens did not allow detailed histological examination. All measurements are given in mm as the range followed by the mean of 5 measurements in parentheses.

Calostaurus dorcopsis sp. nov.

FIGS 1–10

Description based on fragments of several specimens; no complete cestodes present. dorsal system, ramifying across proglottis. In Moderate sized cestodes. Maximum length of fragments 105; maximum width 4. Largest fragment contains 350 proglottides. Scolex large, 0.90–1.16 (1.00) in diameter, quadrangular in *en face* view, with eversible rostellum 0.42–0.49 (0.52) in diameter. Rostellum armed with approximately 1600 hammer shaped hooks in two rows, arranged in shape of Maltese cross, with axes extending between pairs of suckers; hooks 0.012–0.014 (0.013) long. Base of rostellum armed with approximately 16 transverse rows of rose thorn shaped hooks each 0.007–0.011 (0.010) long, with awl shaped blade and irregular and highly variable bifid base. On everted rostellum, hooks extend almost to extremities of Maltese cross; never lie between arms of cross. Rostellum varies considerably in shape (Figs 1, 2) depending upon degree of extension. Rostellar spines form narrow band anterior to rostellum at opening to rostellar sac when latter fully retracted. Suckers 0.27–0.32 (0.29) in diameter; margins armed with seven to nine rows of tiny awl-shaped spines 0.006–0.008 (0.007) long. Neck 0.38–0.75 (0.52) long.

Proglottides craspedote; velum overhanging adjacent proglottis, very narrow. Mature proglottides greatly extended transversely, 0.20–0.45 (0.36) × 2.4–4.0 (2.9), ratio width: length 1:5–1:20. Genital pores single, unilateral. Genital ducts pass between osmoregulatory canals. Dorsal osmoregulatory canal extremely narrow, 0.01–0.03 (0.02) in diameter, lies well internal to ventral canal; ventral osmoregulatory canal 0.05–0.09 (0.07) in diameter. Transverse osmoregulatory canals connect left and right dorsal and ventral canals at posterior margin of each proglottis. Complex, branching network of canals arises from

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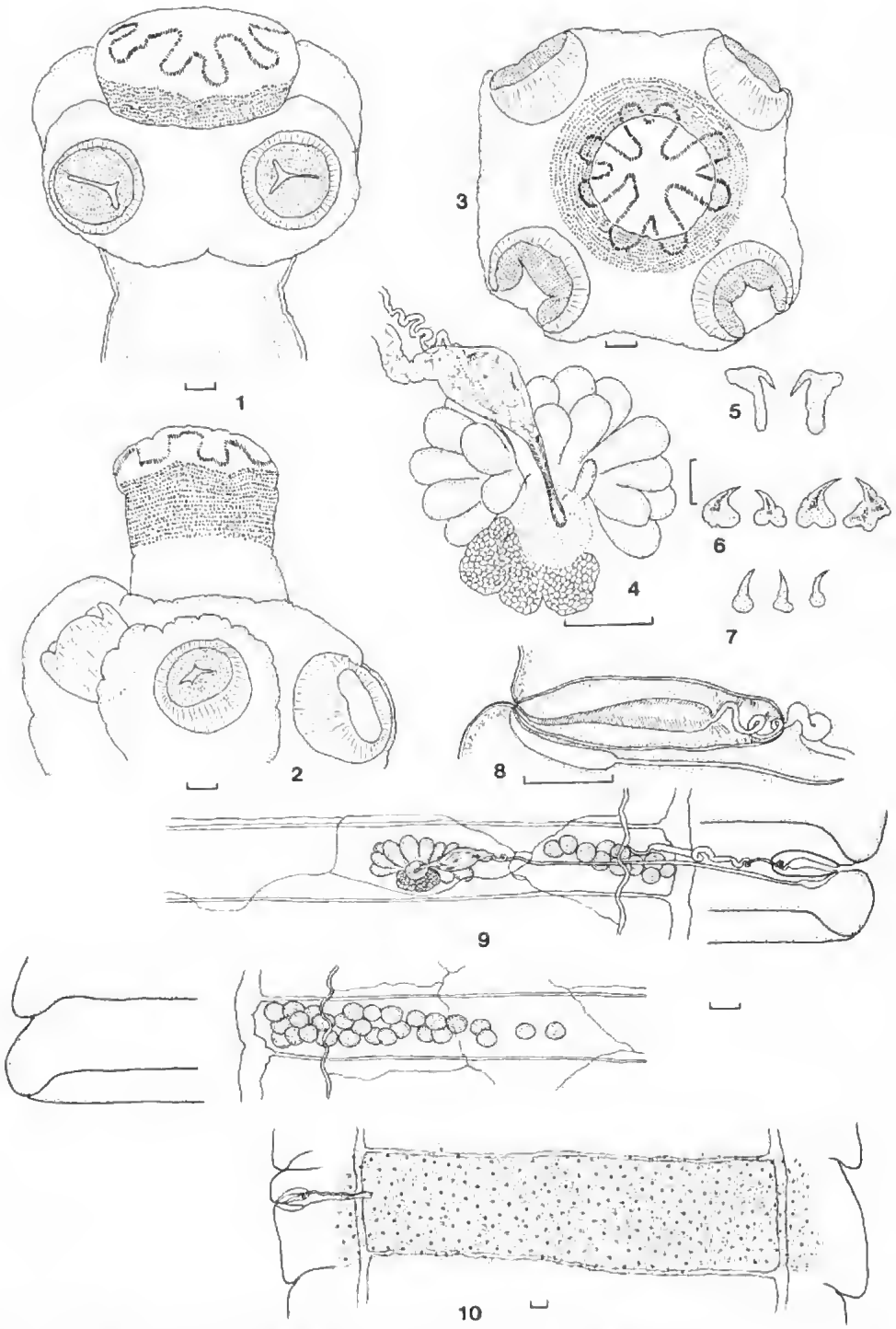


Figs 1-10. *Calostaurus dorcopsis* sp. nov. from the wallaby *Dorcopsis veterum*. 1. Scolex with partially everted rostellum. 2. Scolex with fully evert rostellum 3. Scolex with retracted rostellum, *en face* view. 4. Female genitalia, dorsal view. 5. Rostellar hooks. 6. Rostellar spines. 7. Sucker spines. 8. Cirrus sac and distal vagina. 9. Single mature proglottis. 10. Gravid proglottis. Scale lines: Figs 5-7, 0.01 mm; Figs 1-4, 8-10, 0.1 mm.

largest fragment, genital anlage appears in approximately 50th proglottis. Male and female genitalia mature in proglottides 200 and 260 respectively, and involute in proglottides 425 and 340 respectively. First gravid proglottis 345th.

Genital atrium small, situated in anterior half of lateral proglottis margin. Cirrus sac small, 0.20–0.25 (0.22) × 0.07, elongate, muscular walls feeble, cirrus sac not reaching ventral osmoregulatory canals. Distal region of cirrus of greater internal diameter, lined with bristles; remainder narrow, coiled. Internal and external seminal vesicles absent. Vas deferens slightly coiled, narrow, passes medially towards centre of proglottis, terminating dorsal to ovary. Vasa efferentia not seen. Testes invariably distributed in two lateral groups, extending from ventral osmoregulatory canals, below dorsal canals, medially. Testes densest in lateral regions of each field; testes never overlie female genital glands; testes 0.05–0.06 (0.06) in diameter. Testes number 37–51 per proglottis; always more testes in aporal field; 8–23 (15) testes in poral field, 21–39 (31) in aporal field. Some differences evident in testis number between strobilae: in one strobila 8–13 (10) poral, 34–39 (37) aporal; in second strobila 16–23 (20) poral, 22–28 (24) aporal.

Vagina opens to genital atrium posterior to cirrus sac. Distal region, 0.08–0.13 (0.10) × 0.02, dilated, armed with fine bristles. Mid-region narrow, uncoiled, leads medially, posterior to vas deferens, terminates in fusiform seminal receptacle 0.12–0.18 (0.15) × 0.03–0.07 (0.05) in size, lying dorsal to poral lobe of ovary; sperm duct passes posteriorly from seminal receptacle, lined with bristles. Ovary bilobed, situated to poral side of proglottis midline, 0.15–0.20 (0.18) × 0.26–0.38 (0.32) in size, with 8–10 clavate lobules in each lobe. Vitellarium ovoid or bean-shaped, 0.07–0.09 (0.08) × 0.12–0.16 (0.15) in size, posterior and dorsal to ovary. Mehlis' gland spherical, anterior to vitellarium. Uterine duct short, passes anteriorly from Mehlis' gland, terminates dorsal to ovary. Uterus absent. Eggs discharged from uterine duct directly into parenchyma, become surrounded by capsule, with one egg per egg capsule. Size of egg capsule 0.05–0.06 (0.055); egg 0.01–0.02 (0.015). Gravid proglottides extended transversely 0.21–0.70 (0.49) × 2.2–3.6 (3.1), width:length ratio 1:3–1:7. Terminal proglottides relatively longer, occasionally as long as wide 0.90–1.10 (1.03) × 1.05–1.55 (1.31).

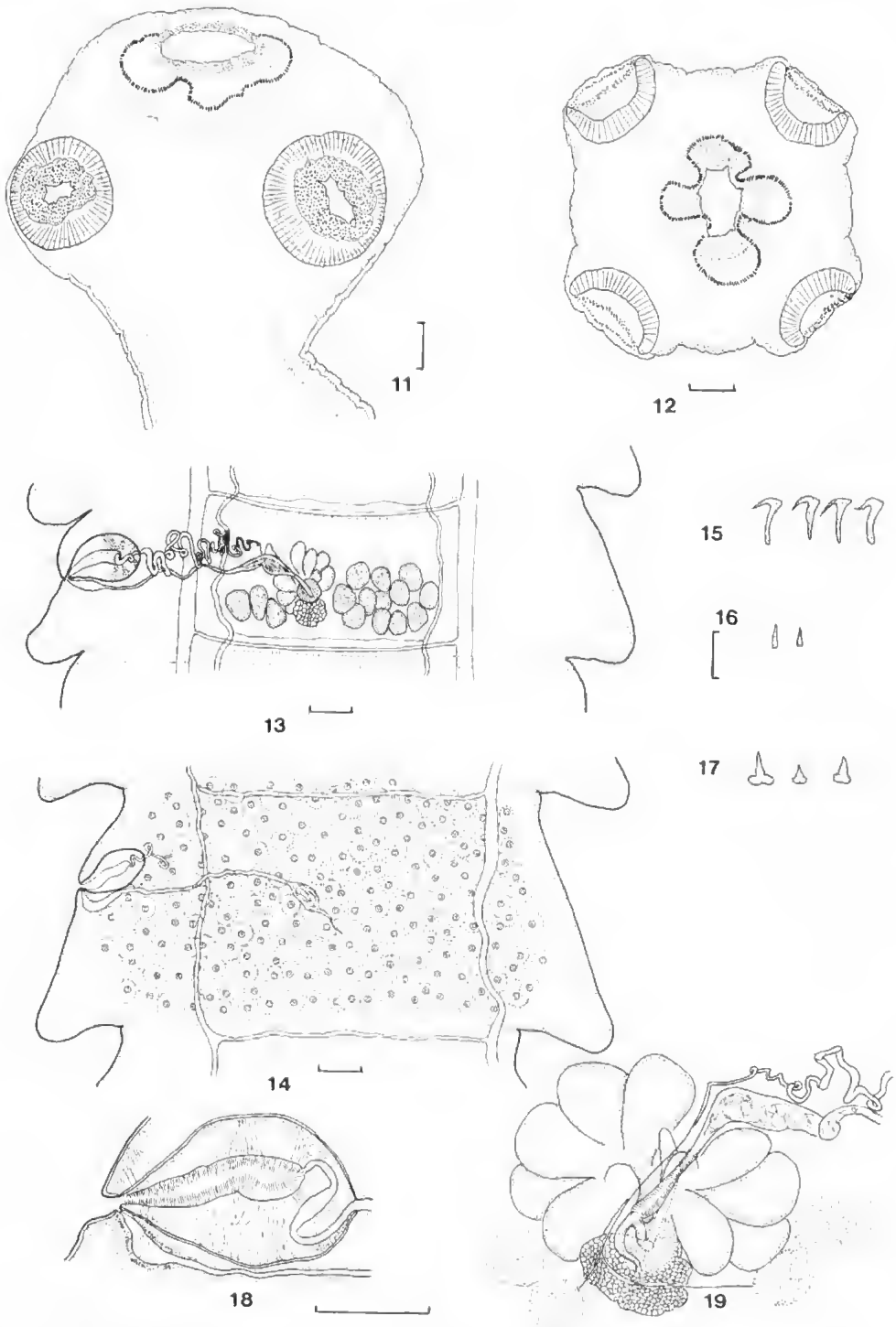
Host: *Dorcopsis veterum* (Lesson, 1827) (Marsupialia: Macropodidae). *Location:* Small intestine. *Type Locality:* Veikabu Creek, Central Province, 9°10'S, 147°09'E, Papua New Guinea. *Types:* In British Museum (Natural History), holotype 1981.6.17.1, paratypes, 1981.6.17.2–10. *Etymology:* The specific name is derived from that of the host.

Calostaurus oweni sp. nov.

FIGS 11–19

Description based on 10 complete mounted specimens. Small cestodes, 24–38 (33) long; maximum width 1.2–1.4 (1.3); strobilae contain 100–147 (120) proglottides. Scolex relatively large, 0.62–1.05 (0.99) in diameter, quadrangular in *en face* view, with rostellum up to 0.45 in diameter when everted. Rostellum armed with approximately 1000 hammer shaped hooks in two rows, arranged in form of open cross, with axes extending between pairs of suckers; rostellar cross 0.25–0.32 (0.29) × 0.18–0.34 (0.26); rostellar hooks 0.007–0.010 (0.008) long. Base of rostellum armed with concentric rows of tiny awl shaped spines approximately 0.004 long. Spines form band posterior to rostellar cross on everted rostellum, never lie between arms of cross; spines form band anterior to rostellar cross, at opening of rostellar sac when rostellum fully retracted. Suckers 0.16–0.23 (0.21) in diameter; margins armed with about eight rows of tiny, rose thorn shaped spines 0.004–0.007 (0.006) long. Neck 0.21–0.34 (0.28) long.

Proglottides craspedote; velum overhanging adjacent proglottis very narrow. Mature proglottides wider than long, 0.27–0.33 (0.31) × 1.20–1.33 (1.25), ratio length:width 1:3.5–1:4.3. Genital pores single, unilateral; one proglottis found with reversed orientation. Genital ducts pass between osmoregulatory canals. Dorsal osmoregulatory canal extremely narrow, 0.005 in diameter, sinuous, lies internal to ventral canal; ventral osmoregulatory canal straight, 0.02–0.04 (0.03) in diameter. Transverse osmoregulatory canals connect left and right dorsal and ventral canals at posterior margin of each proglottis. Origins of dorsal transverse canals sometimes variable, single transverse canal occasionally arising from two or more points on dorsal longitudinal canal.



Figs 11-19. *Calostaurus oweni* sp. nov. from the wallaby *Dorcopsis veterum*. 11. Scolex with retracted rostellum, lateral view. 12. Scolex with retracted rostellum, *en face* view. 13. Mature proglottis. 14. Gravid proglottis. 15. Rostellar hooks. 16. Rostellar spines. 17. Sucker spines. 18. Cirrus sac and distal vagina. 19. Female genitalia dorsal view. Scale lines: Figs 15-17, 0.01 mm; Figs 11-14, 18, 19, 0.1 mm.

Genital anlage appears in proglottides 25–40 (31). Male and female genitalia mature in proglottides 52–73 (64) and 70–98 (81) respectively, and involute in proglottides 85–112 (97) and 75–102 (91) respectively. First gravid proglottis 89–120 (104).

Genital atrium very small, situated in middle of lateral proglottis margin. Cirrus sac large, 0.16–0.18 (0.17) × 0.09–0.11 (0.10), ovoid, muscular walls feeble, cirrus sac not reaching longitudinal osmoregulatory canals. Distal region of cirrus of greater internal diameter, lined with bristles; remainder narrow, coiled muscle bands run from cirrus to internal surface of cirrus sac. Internal and external seminal vesicles absent. Vas deferens greatly coiled, passes medially towards centre of proglottis, gradually diminishing in diameter, terminates dorsal to ovarian isthmus by dividing into two vasa efferentia each supplying one group of testes. Testes almost invariably distributed in two lateral groups, in posterior half of proglottis, extending medially from dorsal osmoregulatory canals. In very occasional proglottides, one or two testes present posterior to vitellarium joining two lateral testis groups. Testes ovelie ovarian lobes and occasionally vitellarium; testes 0.045–0.055 (0.050) in diameter. Testes number 15–19 (16) per proglottis; always more testes in aporal field: 3–7 (5) poral, 10–14 (12) aporal.

Vagina opens to genital atrium posterior to cirrus sac. Distal region, 0.05–0.08 (0.07) × 0.02, dilated. Mid-region narrow, sinuous, leads medially, posterior to vas deferens, terminates in fusiform seminal receptacle, 0.07–0.11 (0.09) × 0.03–0.04 (0.04) in size, lying anterior and dorsal to poral lobe of ovary; sperm duct passes posteriorly from seminal receptacle, dilates, lined with bristles. Ovary bilobed, situated to poral side of proglottis mid-line, 0.10–0.18 (0.13) × 0.17–0.20 (0.18) with 4–5 clavate lobules in each lobe. Vitellarium ovoid or bean shaped, lobulate, 0.05–0.07 (0.06) × 0.07–0.08 (0.07) in size, situated posterior and dorsal to ovary. Mehlis' gland spherical, anterior to vitellarium. Uterine duct passes anteriorly from Mehlis' gland terminated in midline dorsal to ovary. Uterus absent. Eggs discharged from uterine duct directly into parenchyma, become surrounded by capsule, with one egg per egg capsule. Size of egg capsule 0.04–0.05 (0.047); egg 0.01–0.02 (0.15). Gravid proglottides extended transversely 0.41–0.55 (0.45) × 0.95–1.33 (1.20), width:length ratio 1:1.17–1:2.7. Terminal proglottides almost as long as wide or longer than wide, 0.62–0.75 (0.69) × 0.52–0.88 (0.70), width:length ratio 1:0.74–1:1.3.

Host: Dorcopsis veterum (Lesson, 1827) (Marsupialia: Macropodidae). *Location:* small intestine. *Type Locality:* Veikabu Creek, Central Province, Papua New Guinea. *Types:* In British Museum (Natural History), holotype 1981.6.17.11, paratypes 1981.6.17.12–21.

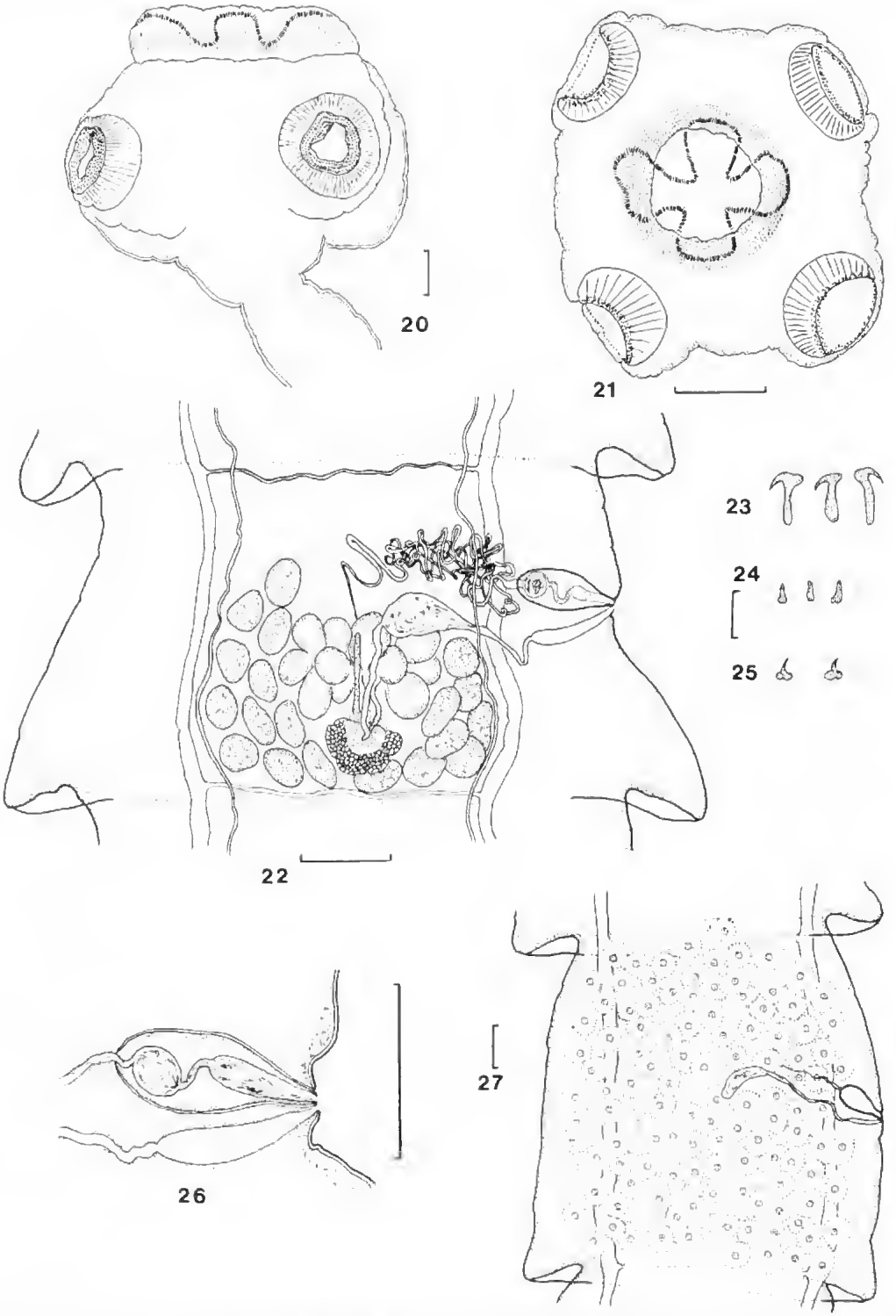
Etymology: this species is named after Dr I. L. Owen who collected all the material described here.

Calostaurus parvus sp. nov.

FIGS 20–27

Description based on five complete mounted specimens. Small cestodes, 9.0–11.2 (9.7) long; maximum width 0.75–1.20 (0.96); strobilae contain 38–57 (42) proglottides. Scolex relatively large, 0.62–1.08 (0.76) in diameter, quadrangular in *en face* view, with eversible rostellum. Rostellum armed with approximately 1000 hammer-shaped hooks in two rows, arranged in form of open cross, with axes extending between pairs of suckers; rostellar cross 0.29–0.47 (0.35) × 0.28–0.42 (0.34); rostellar hooks 0.009–0.010 (0.010) long. Base of rostellum armed with concentric rows of tiny awl-shaped spines, with simple or bifid base; spines 0.004–0.005 (0.005) long. Spines form band anterior to rostellar cross, at opening of rostellar sac, when rostellum fully retracted. Suckers 0.19–0.23 (0.20) in diameter, margins armed with about 10 rows of tiny rose thorn shaped spines 0.002–0.005 (0.003) long. Neck short.

Proglottides craspedote; velum overhanging adjacent proglottis very narrow. Mature proglottides wider than long 0.24–0.35 (0.32) × 0.64–0.98 (0.75), ratio length:width 1:2.0–1:3.8. Genital pores single, unilateral. Genital ducts pass between longitudinal osmoregulatory canals. Dorsal osmoregulatory canal extremely narrow, sinuous, 0.005–0.010 (0.006) in diameter, lies immediately internal to ventral canal; ventral osmoregulatory canal 0.015–0.020 (0.017) in diameter. Transverse osmoregulatory canals connect left and right ventral canals at posterior margin of each proglottis. Genital anlage appears in proglottides 8–28 (12). Male and female genitalia mature in



Figs 20-27. *Calostaurus parvus* sp. nov. from the wallaby *Dorcopsis veterum*. 20. Scolex with everted rostellum, lateral view. 21. Scolex with retracted rostellum, *en face* view. 22. Mature proglottis. 23. Rostellar hooks. 24. Rostellar spines. 25. Sucker spines. 26. Cirrus sac and distal vagina. 27. Gravid proglottis. Scale lines: Figs 23-25, 0·01 mm; Figs 20-22, 26, 27, 0.1 mm.

proglottides 14–37 (22) and 20–28 (25) respectively and involute in proglottides 33–36 (35) and 30–34 (32) respectively. First gravid proglottis 34–38 (36).

Genital atrium insignificant, situated slightly anterior to middle of lateral proglottis margin. Cirrus sac small, 0.07–0.10 (0.09) × 0.04–0.05 (0.04), clavate, muscular walls feeble, cirrus sac almost reaching longitudinal osmoregulatory canals. Distal region of cirrus of greater internal diameter; armature not seen; mid-region narrow, sinuous; proximal region forms small, spherical internal seminal vesicle; present in most proglottides of all strobilae examined, but not detectable in every single proglottis; internal seminal vesicle 0.020–0.035 (0.025) × 0.025–0.030 (0.026). External seminal vesicle absent. Vas deferens narrow, greatly coiled, surrounded by pale basophilic cells, passes medially towards centre of proglottis, then posteriorly towards ovary; terminates dorsal to ovarian isthmus; vasa efferentia not seen. Testes distributed in posterior part of proglottis, in single field, confluent posterior to vitellarium; testes lie within area bounded by lateral osmoregulatory canals; usually lie medial to dorsal canals, but few testes may overlie dorsal canals. Testes not confluent posterior to vitellaria in few proglottides. Testes usually overlie ovary and vitellarium; testes 0.04–0.05 (0.045) in diameter. Testes number 17–22 (20) per proglottis; poral testes 6–10 (8), invariably less numerous than aporal testes 11–14 (13).

Vagina opens to genital atrium posterior to cirrus sac. Distal region, 0.06 × 0.02, dilated. Mid-region narrow, sinuous, leads medially, posterior to vas deferens, terminating in large clavate to pyriform seminal receptacle, 0.08–0.13 (0.09) × 0.04–0.05 (0.05), lying anterior and dorsal to poral lobe of ovary; sperm duct elongate, sinuous, passes posteriorly from seminal receptacle. Ovary bilobed, situated in proglottis mid-line, 0.09–0.16 (0.14) × 0.14–0.16 (0.15) in size with 4–6 clavate lobules in each lobe. Vitellarium ovoid or bean shaped, lobulate, 0.05–0.08 (0.06) × 0.04–0.05 (0.05) in size, situated posterior and dorsal to ovary. Mehlis' gland spherical, anterior to vitellarium. Uterine duct passes anteriorly from Mehlis' gland, terminates in midline, anterior to ovary. Uterus absent. Eggs discharged from uterine duct directly into parenchyma, become surrounded by capsules, with one egg per egg capsule. Size of egg capsule 0.05–0.07 (0.06); egg 0.015. Gravid proglottides longer than wide 0.65–0.75 (0.69) × 0.67–1.10 (0.83), ratio length: width 0.64:1–1:1.1. Terminal proglottides 0.85 × 0.58–0.68 (0.73), ratio length:width 1.2:1–1.4:1.

Host: *Dorcopsis veterum* (Lesson, 1827) (Marsupialia: Macropodidae). *Location*: Small intestine. *Type locality*: Veikabu Creek, Central Province, Papua New Guinea. *Types*: In British Museum (Natural History), holotype 1981.6.19.1, paratypes 1981.6.19.2–6. *Etymology*: the specific name *parvus* derives from the fact that it is the smallest known species of the genus.

Discussion

Three species of *Calostaurus* have been described previously, being distinguished principally by the shape of the cross formed by the rostellar hooks. *C. macropus* has the hooks arranged in the shape of a Maltese cross, *C. thylogale* in a six-lobed circle and *C. mundayi* in a four-lobed cross. Of the species described here, *C. dorcopsis* sp. nov., most closely resembles *C. macropus* in that the hooks are arranged in the form of a Maltese cross whereas *C. oweni* sp. nov. and *C. parvus* sp. nov. both have rostellar hooks arranged in the form of four-lobed crosses similar to that of *C. mundayi*. The histological anatomy of the scoleces of the new species is similar to that of *C. thylogale* and *C. mundayi* and has therefore not been described in detail.

Both *C. oweni* and *C. parvus* can be distinguished from *C. mundayi* by size alone, since *C. mundayi* measures 32.4 to 45.1 cm, whereas *C. oweni* and *C. parvus* measure 2.4–3.8 and 0.9–1.1 cm respectively. In addition *C. mundayi* has one to three eggs per egg capsule while the other species have a single egg in each capsule, and the range of testis number in *C. mundayi* (25–32) is higher than in *C. oweni* (15–19) and *C. parvus* (17–22).

C. oweni and *C. parvus* differ from one another in a number of features. Gravid specimens of *C. parvus* are consistently smaller and have fewer proglottides than *C. oweni*, and there is a difference in the rate of development and involution of the genital organs in the two species. The testes are generally confluent posterior to the vitellaria in *C. parvus*, but are divided into two groups in *C. oweni*. Some variation in this character does occur and

TABLE 1. Principal features and measurements of species of *Calostaurus*

Species	Length (cm)	No. proglottides	Form of cross	Lenth of rostellar hooks (μm)	No. rostellar hooks	Size of cirrus sac (mm)	Internal seminal vesicle	No. testes per proglottis p = poral ap = aporal	Testes extend beyond dorsal osmoregulatory canals	Testes Confluent posterior to vitellarium	No. eggs per Capsule
C. macropus											
Ortlepp (1922)	24-35	—	Maltese cross	9	1300	0.10	—	50	+ (from type)	—	1
Sandars (1957)	4-5	—	Maltese cross	—	2500	0.08-0.12	—	35-55 p 12-16 ap 22-29	+ (from new specs)	—	1
C. thylogale	34.5	hundreds	6 lobed circle	30-40	300-350	0.10-0.14	—	70-94 p 26-26 ap 50-73	—	+	1
C. mundayi	32.4-45.1	hundreds	4 lobed cross	10-13	700	0.10-0.11	—	25-32 p 5-11 ap 16-22	—	—	1-3 (2)
C. dorcopsis	>10.5	>350	Maltese cross	12-15	1600	0.20-0.25	—	37-51 p 8-23 ap 21-39	+	—	1
C. oweni	2.4-3.8	100-147	4 lobed cross	7-10	1000	0.16-0.18	—	15-19 p 3-7 ap 10-14	—	—	1
C. parvus	0.9-1.1	38-57	4 lobed cross	9-10	1000	0.07-0.10	+	17-22 p 6-10 ap 11-14	—	+	1

occasional proglottides of *C. parvus* have the testes in two groups, while occasional proglottides of *C. oweni* have the testes confluent posterior to the vitellaria, but in an individual strobila, one form or the other very clearly predominates. The cirrus sac of *C. parvus* (0.07–0.010 mm) is invariably smaller than that of *C.oweni* (0.16–0.18) though the size difference may be a reflection of overall cestode size. However, all specimens of *C. parvus* examined possess an internal seminal vesicle, a feature which is not present in any congener. It is not detectable in every single proglottis, but is invariably visible in some proglottides of a strobila. These various differences are considered adequate for the erection of two new species.

Comparisons of *C. dorcopsis* with *C. macropus* are complicated by the fact that the latter species has been described on two occasions, firstly by Ortlepp (1922) from *Thylogale brunii* and later by Sandars (1957) from *Thylogale stigmatica* (=*Thylogale wilcoxi*), the descriptions differing on some important features such as size and the number of the rostellar hooks.

C. dorcopsis is similar to both descriptions of *C. macropus* in the form of the rostellar cross, in the number and distribution of the testes and in the transversely elongated mature proglottis. *C. dorcopsis* would appear to differ from all congeners by the distribution of the testes which extend laterally beyond the dorsal osmoregulatory canals to the medial edge of the ventral canals. However, this condition also exists in the type material of *C. macropus* in the British Museum (Natural History), (though not stated by Ortlepp (1922) in his description) and in material collected by me from *Thylogale stigmatica* in Queensland, conforming in all respects to the specimens described by Sandars (1957) from the same host and same general geographic region. Sandars (1957) gave the locality of her specimens incorrectly as 'Mt. Tamborine in South Australia'; Mt. Tamborine is in Queensland; no species of *Thylogale* occur in South Australia.

C. dorcopsis differs from *C. macropus* in a number of features. The cirrus sac in *C. dorcopsis* (0.20–0.25) mm) is larger than in descriptions of *C. macropus* (0.10, 0.08–0.12 mm); the rostellar hooks of *C. dorcopsis* (12–15μm) are slightly longer than those of *C. macropus* (9μm) and the rostellar spines of *C. dorcopsis* (7–11μm) are longer than those of *C. macropus* (5–6μm) and are of a different shape. The differences in the rostellar spines are very striking indeed as they are very prominent rose-thorn structures on the rostella of *C. dorcopsis* but are inconspicuous and awl or hook shaped on rostella of *C. macropus*. Both Ortlepp (1922) and Sandars (1957) described and illustrated the rostellar spines of *C. macropus* as covering the entire rostellum with the exception of the area inside the rostellar cross. It has not been possible to verify this situation since in the type specimen examined by me and in the new material from *T. stigmatica*, most of the rostellar spines are missing. Assuming the earlier descriptions to be correct, *C. dorcopsis* differs markedly from *C. macropus* in having the rostellar spines arranged in about 20 transverse rows, forming a distinct band on the everted rostellum but never covering the entire surface of it.

Because of these differences, *C. dorcopsis* sp. nov. has been described. It is evident however that the morphology of *C. macropus* requires re-investigation based on new material from the type host, *T. brunii*. The extant type material is inadequate for a thorough redescription and the status of specimens from *T. stigmatica*, described by Sandars (1957) as *C. macropus* requires clarification.

The principal of differences between species of *Calostaurus* are shown in Table 1.

Acknowledgements

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